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'Test Driving' a Financing Instrument for Climate Adaptation: Analyzing Institutional Dilemmas using Simulation Gaming

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ABSTRACT

Urban physical public infrastructure is a frontline defense mechanism to manage and mitigate climate-related impacts. Market instruments are often cited as possible means to spread risk and reduce financial burdens on the public sector. The authors argue that existing research tends to focus on the technical issues of instruments and neglects considering institutional dynamics that may enable or constrain local market-based financing mechanisms. In this article, three core dilemmas (values uncertainty, planning horizon, and indirect benefits) are used to analyze the responses of practitioners to a possible financing instrument. The findings indicate that the practitioner's responses to tax increment financing were largely shaped by the adaptation dilemmas and not the characteristics of the instrument per se. By mapping the dilemmas onto whether they would recommend it, participants imposed a financial barrier on climate adaptation investments. The authors conclude that a key imperative in the design of policy instruments is to pay attention to the congruency of informal institutions at the 'street level' in order to be in-step with the current sociopolitical conditions. The findings also point to four key attributes that a local market-based instrument would need to be aligned and responsive to the Dutch planning and development context.

KEYWORDS

Climate adaptation; finance; neighborhood planning; public infrastructure; simulation gaming

1. Introduction

Physical public infrastructure is a frontline defense mechanism to manage and mitigate climate-related impacts at the urban level. Mounting evidence has demonstrated that climate change will require cities to make investment decisions and allocate resources to modify existing physical infrastructure, which includes conventional 'grey' infrastructure such as roads, power grids, piped sewer, and water systems, by introducing new strategies that reduce vulnerabilities and increase resilience to changing weather patterns (Carter *et al.*, 2015). Revised designed specifications, robust capital planning, and new types of infrastructure will be required to address adverse impacts, such as permeable pavement,

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renewal of existing systems to separate storm water and sewage, elevation of urban areas, strategically deployed green space and tree planting, additional space for water storage and retention, and enhanced above-grade drainage and grading plans, (Makropoulos & Butler, 2010; Bobylev *et al*., 2013). Cost-benefit research (Hallegatte *et al*., 2012) generally indicates that preventing damage through a commitment to upfront capital costs will alleviate higher costs in the future, such as replacing or repairing damaged properties or costs related to social and economic disruption. Despite the data, adaptation remains a periphery issue on local government budget processes, overshadowed by competition for scarce resources of immediate concerns that can be more readily reconciled with prevailing values, planning cycles, render clear benefits and respond to direct service demands. In other words, policy-makers are confronted with and confounded by a range of dilemmas about how to finance long-term climate adaptation infrastructure.

1.1. Market-based Financing Instruments: Limits or Opportunities for Local Planning?

The question of how to finance investments in climate adaptation at the local level is not unique to the Netherlands. For example, a 2009 study comparing national adaptation strategies across Europe found that no national strategies considered how policy objectives should be financed (Swart *et al*., 2009). More recently, according to a 2013 report issued by the European Environmental Agency, while municipalities have some limitations, particularly with respect to interjurisdictional issues (such as broad-scale flooding impacts), local governments are well positioned to undertake concrete implementation actions using municipal resources and/or raising funds from other sources (Isoard & Winograd, 2013). In addition to regulatory solutions, scholarly and policy-oriented research suggests that market-based mechanisms hold some promise to create conditions for efficient and appropriate solutions (Buchner *et al*., 2011; Heuson *et al*., 2012; Mathews & Kidney, 2012). Other researchers have analyzed possible incentives to attract private investment at the local level, which minimally includes a policy framework that is simple, predictable, and protects property rights (Merk *et al*., 2012). In the aggregate, the research tends to be normative and focused on the technical issues of possible instruments and a dearth that considers behavioral aspects or the role of context. That is, there is little empirical research that focuses on the institutional dynamics that may enable or constrain the application of local-level market-based financing mechanisms in relation to climate adaptation.

Our investigation takes planning and development actors in their institutional context as our starting point to assess the potential of using market-based mechanisms to facilitate investment in climate adaptation. In doing so, we ask: is a local-level market-based mechanism applicable for facilitating investment in climate adaptation? The intention is to generate an actor-centered conceptual understanding about the role of institutional dilemmas in shaping perspectives about the potential application of a market-based financial instrument. The article proceeds as follows: Section 2 sketches out the conceptual framework based on three policy-related dilemmas connected to climate adaptation. These dilemmas get to the heart of the institutional matters concerning financing local-level climate adaptation and are illustrative of how conceptualizations about costs and benefits are embedded within norms and values. Section 3 introduces the Dutch urban planning context from which the empirical data are drawn. As a 'policy lab' of urban adaptation,

we use simulation gaming to explore the role of the adaptation dilemmas in shaping policy instrument selection in the Netherlands. The methods section includes an overview of simulation gaming and the scenario that was used to engage practitioners; secondly, this section describes the financial instrument, known as tax increment financing (TIF), in which participants were asked to 'test drive'. Section 4 summarizes the core findings and subsequently applies the institutional dilemmas conceptual framework to analyze the empirical data in more detail. Section 5 offers concluding remarks and points to directions for further research.

2. Conceptual Framework

2.1. Institutional Dilemmas: Clustering Uncertainty and Reducing Complexity

In 2003, Adger (2003) explicitly connects the critical role and complex nature of institutions in relation to adapting to climate change by stating '… the effectiveness of strategies for adapting to climate change depends on the social acceptability of options for adaptation, the institutional constraints on adaptation, and the place of adaptation in the wider landscape of economic development and social evolution' (388). Actions, in whatever form, to address climate adaptation are nested within a broader institutional context that is shaped and reshaped by formal and informal institutional rules, norms, and practice. Institutions are often described as either formal or informal: Formal institutions are generally understood as government rules that are enforced by the legal system and are expressed as laws, constitutions, ordinances, and local land-use plans. Informal institutional rules are less explicit and emerge via repetition and solidification of behavior through perceptions, values, beliefs, and norms (Buitelaar *et al*., 2011). Informal and formal institutional rules are dynamic and the subject of constant negotiation by organizations and the actors that operate within them (Lowndes, 2005; Buitelaar *et al*., 2011). Institutionalists also acknowledge the role of narratives as a means for people to determine the outer parameters of informal institutions through developing shared understandings and, thus, reducing uncertainty (Lowndes & Roberts, 2013). Narratives also reduce the problem of complexity by clustering knowledge and positions, which function as heuristics (Matthews, 2013). Gigerenzer and Gaissmaier (2011) define heuristics as: 'a strategy that ignores part of the information, with the goal of making decisions more quickly, frugally, and/or accurately than more complex methods.' (454). In that sense, clustering knowledge into bite-sized pieces functions as a heuristic to simplify multifaceted problems and to act as shortcuts for organizational decision-making. So, how do policymakers and practitioners make sense of the complexity associated with climate adaptation? What 'short-cuts' and rationales do they use to overcome complex problems? We identify three dilemmas that are addressed in the literature (Adger *et al*., 2009; Haug *et al*., 2010; Walker *et al*., 2011; Mees *et al*., 2012; Preston *et al*., 2013): value uncertainty, planning horizon problems, and indirect benefits. Figure 1 illustrates our conceptual framework based on three spheres: (1) climate adaptation as a planning issue; (2) uncertainty and complexity as a decision problem; and (3) the decisions problems are bundled into thematic clusters of the institutional dilemmas. These institutional dilemmas are emblematic and a composite of signals from the institutional context in which they are derived from and, thus, function as heuristics.

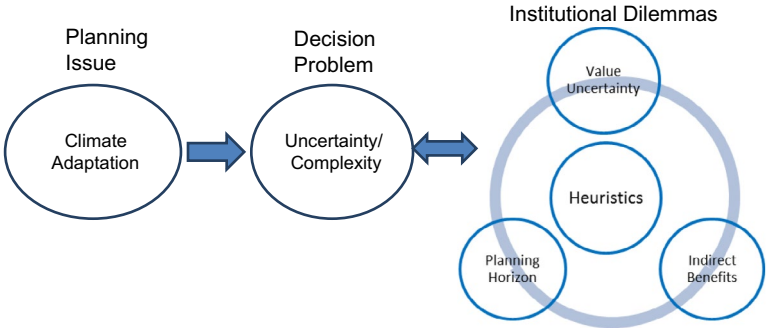

Figure 1. Institutional dilemmas in planning for climate change: value uncertainty, planning horizon, and indirect benefits.

The remainder of this section outlines the core features of the institutional dilemmas that form the conceptual backdrop for the analysis set out in Section 4.

2.1.1. Values Uncertainty

Uncertainty is a fundamental and broadly accepted conundrum of adapting to climate change. Uncertainties relate to the complexity of the climatic system, the types of impacts that can be expected, and the effectiveness of adaptation strategies to mitigate the wide ranging impacts (Giordano, 2012; Hallegatte *et al.*, 2012). An interconnected issue is the problem of value uncertainty. Adaptation choices are guided by a sense of value and the lack of agreement about how current generations value climate adaptation, let alone future generations, limits our ability to address anticipated problems (Adger *et al.*, 2009; Walker *et al.*, 2011; Preston *et al.*, 2013). Hulme (2009) argues that multiple ways in which individuals, organizations, societies, and cultures have historically valued and understood climate is a challenge, to say the least, to reconcile. While Hulme focuses attention on the global project to govern climate change, local planning offers a granular level of value uncertainty. Adaptation to climate change is intertwined with value conflicts associated with land, environmental protection, health, safety, and resource allocation (Walker *et al.*, 2011).

The lack of agreement on value (material or otherwise) is a core governance challenge. The lack of agreement results in climate adaptation at the local level largely remaining within the government domain, with an undefined set of institutional arrangements. The values uncertainty dilemma positions adaptation as a choice between priorities and the need to make trade-offs between what is 'valued'. As Adger *et al.* (2009) state, 'it all depends on goals, values, risks, and social choice' (338). Yet without a set of collective values to demarcate choices, values compete in the political arena and, according to Preston *et al.* (2013), a '… persistent bias toward maintaining economic values over social, cultural, or environmental values' places limits on adaptation (1020). Different approaches to overcome what can be conceived of as the 'value gap', such as no-regrets strategies or mainstreaming adaptation into existing processes and policies, are intended to reconcile the values uncertainty dilemma.

2.1.2. Planning Horizon

A second dilemma to adapting to climate change is that the planning horizon is substantially out-of-sync with conventional planning approaches. Indeed, addressing uncertainty in

long-term infrastructure investment planning is not a new phenomenon; however, adaptation to climate change adds further temporal and spatial complexity. The planning horizon dilemma is often portrayed as a tension between ethical and classic rational deliberative planning. Alexander (2000) describes the objective of classic rational deliberative planning is '… for the actor to decide on the ends of future action and what the course of the action would be most effective' (247). Ethical arguments suggest that future generations ought to be appropriately considered and sufficient investments made to avoid or limit the adverse impacts of climate change (Preston *et al.*, 2013). From a rational deliberative planning perspective, complex data analyses in cost-benefit research are conducted to assert that investments by current generations will render benefits in the near term and over the long term, particularly given that the life span of land-use planning and infrastructure decisions ranging anywhere from 30 to 200 years (Hallegatte, 2009). The objective of cost-benefit analysis research is to demonstrate that investments need not require large upfront sums, but can be achieved through improved coordination of capital planning and maintenance regimes. As argued by Hallegatte (2009), committing to additional infrastructure costs in anticipation of future climate changes, '… may be the only way of avoiding large building and infrastructure retrofitting costs in a few decades' (241). Other arguments suggest there is a strong economic rationale for using insurance to avoid imposing a financial burden on the current generation (Harrison, 2010), given climate adaptation is a problem with such range of uncertainties. Despite the different positions, it is clear that assembling a package of policy instruments is not a straightforward technocratic undertaking for two core reasons: the long-term planning horizon of climate adaptation is not calibrated to the comparatively short-term capital planning processes and, secondly, political cycles of local government are even shorter than these planning processes. Instead, the dilemma is about making choices between, as Walker *et al.* commented, '… relatively short-term, no-regrets types of strategies' that are likely to be suboptimal overtime (2011).

2.1.3. Indirect Benefits

In the context of local government, municipalities face political pressures in relation to the degree to which local benefits are rendered in connection to financial risk and the use of local resource. According to the benefits view of public finance (Musgrave & Musgrave, 1989), the costs of local public services ought to be based on the preferences of the benefiting residents. This view establishes a link between the willingness to pay and the constraints placed on local governments by taxpayers to deliver an acceptable package of local services and programs (Fischel, 2000). In the benefits model of public finance, the principle of equity is achieved if those who benefit from the service also pay for the service. The benefit can be direct or indirect, but a benefit must be derived from the expenditure. The dilemma for adaptation investments is the degree to which clear benefits can be established. Walker *et al.* argue that facing a choice, '… people who are asked to make economic sacrifices today—that may benefit future generations but will not benefit them directly—may lack the incentives to implement long term adaptation strategies' (Walker *et al.*, 2011). A lack of observable direct benefits is also cited as a reason why the market is comparatively inactive as a player in adaptation, in comparison with the public sector. Several reasons may account for this, including assumptions about the potential constraints, financial, technological, and spatial, that adaptation requirements may impose on private actors and, secondly, the time-lag between bearing the costs and the reaping of benefits of investments (Mees *et al.*, 2012).

We now turn to an overview of the research context and description of the method employed in this study.

3. Methodology

This section briefly describes the Dutch case, the simulation game method, and provides background about TIF and the simulation game specifically designed for use in this research.

3.1. Urban Adaptation to Climate Change in the Netherlands: A Policy Laboratory

In the Netherlands, the national government has accepted projections that climate change will take place, as evidenced by the national adaptation program that was launched in 2007 and ongoing development by the Delta Program. The Netherlands is regarded as a front-runner in climate adaptation, particularly with respect to water management, and has attracted international attention with flood risk management approaches such as 'Room for the River' and playing a role in the global networking 'Connecting Delta Cities' initiative. The Delta Program is responsible for developing recommendations for adaptation to climate change in the Netherlands (Termeer *et al.*, 2011). The urban-focused component, under the New Housing Development and Restructuring Program (Deltaprogramma, 2010, 2012a, 2012b), sets out a direction that local-level climate adaptation-related infrastructure improvements will be delivered using existing spatial planning investments frameworks, which includes coupling adaptation investments with market redevelopment activities overtime (Delta Programme, 2014). This outlook is consistent with the characterization of Dutch spatial planning as having transitioned into an era that is heavily focused on market-based processes and principles (Heurkens, 2012). Numerous studies have been commissioned by the national government in the search for possible market models and policy instruments that could be transferred to the Dutch context.[1] In the foreseeable future, however, it is unclear how Dutch municipalities will be able to finance adaptation measures given the stagnate development sector (Deltaprogramma, 2011). Thus, given the active policy process driven by the Delta program and search for the new 'holy grail' of planning instruments and financing models, the Netherlands represents a kind of policy laboratory and a fertile research context in which to explore new approaches to financing climate-proofing local-level public infrastructure.

3.2. Simulation Gaming: An Experiential Method

Despite recognition as a forerunner in water-related climate adaptation, policies and governance approaches that are specific to urban adaptation are still in the early stages of formation, which presents a challenge for empirical research (van Buuren *et al.*, 2015). Exploring the application of a policy instrument, firstly, not used in the Netherlands, and secondly, not conventionally applied to the problem of investing in adaption also presents a challenge for social scientists. The question of whether TIF (see Sections 3.3.1 and 3.4.3.2 for background) is a potential instrument for local policymakers to raise funds to support long-term investments in climate adaptation could, on the surface, be assessed based on technical criteria. However, this approach offers a narrow bandwidth on which to address this complex question. The application of simulation gaming, as an actor-centered method, is an effective means to consider the sociopolitical characteristics that play a role in policy

instrument selection. As identified in the preceding section, grasping such issues as the planning horizon mismatch, the indirect benefits problem between current investors and future users, and lacking a cohesive set of social values on climate adaptation presents planning practitioners with intractable problems. Drawing from simulation gaming literature (Daré & Barreteau, 2003; Mayer & Veeneman, 2003; Klabbers, 2009; Mayer, 2009; Meijer, 2009; Shubik, 2009; Crookall, 2010), this method was selected because, as a highly interactive format often used in policy-making, it allows researchers to study the behaviors of participants using a specifically designed reference system. Thus, it provides a format to develop an understanding about complex '… tacit knowledge' (Klabbers, 2009) embedded within practitioner's perspectives that is based on experience, but often difficult to articulate.

3.3. 'Test Driving' a Financing Policy Instrument: A Novel Policy Instrument

As implied by the metaphor included in the title of this article, participants of the simulation game were asked to 'test-drive' a financing instrument. The metaphor makes an explicit connection to the simulation game scenario that provided a setting for participants to experience a novel instrument. The aim was to introduce participants to an instrument that they had no practical experience within a multidimensional format. Thus, the simulation game session provided a decision-making environment to debate and develop opinions without the risk of professional or institutional damage.

Given the research objective, participants were asked to consider the use of TIF as a means to facilitate investment in climate adaptation. We conceived of the assignment as an institutional challenge wherein participants were confronted with considering whether existing formal structures and informal institutional norms/values could accommodate TIF. The simulation game was designed to focus on normative issues, rather than technical aspects that may (or may not) impede the application of TIF in the Netherlands. The purpose of the research was to qualitatively explore the sociopolitical dimensions of operationalizing TIF and to consider how participants distinguished their arguments about the applicability of a particular local income stream—namely property taxes.

3.3.1. TIF: A Short Overview

TIF is a bounded value capturing instrument (van der Krabben & Needham, 2008) designed to 'earmark the related increment of property tax in a proclaimed area to fund public investments' (Alexander, 2012). While the duration varies, a TIF is typically based on a 25-year-time span in a prescribed designated community improvement area. It is premised on the idea that the provision of new infrastructure in a designated area will increase property values. TIF is used in most American states to address stalled local area investment (Lefcoe, 2011). It has also been adopted in Canada within the last 10 years and more recently in the UK, with the policy objective of adding revenue generating tools at the local level (Squires & Lord, 2012).

Extensive research has focused on the strengths and flaws of TIF. Some researchers have identified governance flaws and misuse in relation to public policy objectives, resulting in benefits to developers and cross-jurisdictional tax revenue absorption issues (Weber, 2003). The latter issue is particular to the way in which school districts are funded in the U.S. Others have criticized the degree to which a public policy rationale exists to justify government intervention and financial risk or whether expediential

investment attracts business or simply displaces businesses from one area to another (Weber, 2010; Chapman & Gorina, 2012). The purpose was not to investigate the strengths and weaknesses of TIF per se. The assumption is that given the underlying long-term incremental characteristics of climate change, instruments conventionally used in planning processes in the Netherlands that focus on capturing immediate return on land value are poorly designed to motivate long-term investment commitments. Secondly, autonomous adaptation by municipalities might be enhanced if resources were available at the local level, and thus not dependent on actions from higher orders of government. During the gaming sessions, players focused on the core issues of whether (1) channeling the extra property tax earnings above the pre-investment tax base into a specific area, rather than into the general city budget, was acceptable or not and (2) whether utilizing an instrument that is premised on market growth is appropriate given Dutch municipalities are currently risk adverse in response to a stagnate planning and development sector. The following section identifies the empirical backdrop that underpinned the simulation game scenario and the specific information on TIF that was provided to participants during the simulation session.

3.4. The Watervliet Safe Haven Simulation Game

In the design of the simulation game, we drew from Peters, Vissers, and Heijne's advice that designers should construct a game '… so it is plausible that participants behave more or less the same way as they would in reality' (1998). The following offers a summary of the systems analysis (Peters & Westelaken, 2014) that underpins the Watervliet Safe Haven simulation game. The design of the scenario draws from scholarly and policy-related research associated with Dutch planning and development, municipal public financing, and the Dutch climate adaptation program (Root *et al.*, 2014, 2015).

3.4.1. Understanding the Institutional Context

As described in Section 3.3, the New Housing Development and Restructuring Program (Deltaprogramma, 2010, 2012a, 2012b) has set out a direction that local-level climate adaptation-related infrastructure improvements will utilize existing spatial planning processes and instruments to lever investment over the long term. The concept of how planning and development processes will be used has been modified since the original conception. The 2008 economic crisis had a profound impact on the Dutch development sector, which stalled many residential and office projects across the country. By way of background, in the Netherlands there has been a historic reliance on real estate value based on what is referred to as the public land development model (Needham, 2007; van der Krabben & Jacobs, 2013). The approach is largely considered unviable in the foreseeable future. It was a model that enabled municipalities to use the market to facilitate community-level investments to deliver a range of public goods (Hartmann & Spit, 2015). This practice resulted in speculative land acquisitions and development projects, which ultimately have left many municipalities burdened with substantial land holdings, financial exposure, and over-supply of houses and offices in their communities (Janssen-Jansen *et al.*, 2012; van der Krabben & Jacobs, 2013).

In 2011, the Delta Program acknowledged that using existing planning and land development approaches and instruments to facilitate local-level adaptation investments, in the

short term, are problematic because many development projects are struggling to remain financially buoyant (Deltaprogramma, 2011). Recently, the 2015 program for urban areas and local adaptation set out a governance agenda that focuses on building a coalition of stakeholders as a step toward gradually embedding adaptation into conventional planning and development practice (Delta Programme, 2014). The approach is an incremental and network-oriented strategy that assumes adaptation is a long-term process that will require broad multisectoral participation. The Delta Program's shift is also consistent with the discourse in the planning and development sector around the idea of 'organic development' (Buitelaar *et al.*, 2014). The concept proposes to shift Dutch spatial planning from comprehensive master planning and large-scale redevelopment to exploring strategies that enable incremental small-scale initiatives incorporating multiple stakeholders and shared financial risk models.

The foregoing provided a high-level summary of the institutional context that Dutch spatial planning and development practitioners are currently confronted with. The Watervliet Safe Haven simulation game draws together these elements into a scenario. The next three sections, firstly, provide a brief description of the scenario that participants were faced with, secondly, the sequencing and management of the simulation materials, and, thirdly, the phasing of the game implementation.

3.4.2. Simulation Game: Description

- *Scenario*: the ambitious mayor of a fictional city in the Netherlands (aka. Watervliet) invites senior municipal staff and private planning and development practitioners to advise City Council on whether to include TIF in the financing strategy for a large redevelopment planned for the city center.
- *Climate Adaptation Investments*: Watervliet needs to replace existing infrastructure in the central city due to current flooding problems and future projections that expect the flooding impacts to drastically increase due to climate change by 2050. The Mayor was keen to introduce a green and blue infrastructure as a strategy to mitigate flood impacts. The Mayor argues such investments will demonstrate to investors that Watervliet is a dynamic city to invest in.
- *Key Issues*: the project is underfunded by approximately 10%; no funding from the national government is expected; the project is the subject of criticism from local media; the Mayor sees the initiative as an important legacy project.
- *Objective*: Each team must make a recommendation to the Watervliet City Council about whether TIF should be used to close the project's financial gap.

3.4.3. Simulation Game Sequencing and Materials

Seven three-hour sessions were held in five different locations in the Netherlands. The simulation game session was advertised via a range of social networking sites, including sites that focus on Dutch spatial planning issues and climate change-related subjects. The result of the outreach strategy was a sampling of 59 experienced spatial planning practitioners and policymakers. The sectoral mix of the participants was a balanced representation of both private sector practitioners and participants that worked for municipalities. The majority of participants were spatial planners, representing process managers, project developers, policymakers, and advisers.

The simulation game sessions were undertaken in several stages. The following is a brief description of pre-game stage and phases within the simulation game itself.

3.4.3.1. Pre-Game

- One week prior: participants received an information package that contained the following:
- Letter from the researchers confirming logistical details and role description
- Simulation Material:

- Invitation from the Mayor of Watervliet
- Letter from national government
- Two fictional newspaper articles from a local newspaper

3.4.3.2. Upon arrival to the Simulation Session

- Questionnaire: participants completed it on an individual basis
- Watervliet redevelopment project budget
- Brochures explaining TIF and 'green' infrastructure

Given the objective was to elicit perspectives about the application of TIF, participants were provided information both in written form and in the presentation by the 'mayor' of Watervliet. The information identified the perceived key strengths and weaknesses of the instrument and conventional policy rationales. For example, participant was informed that a perceived strength is that by recovering value overtime upfront costs are not added (i.e., levy's) to the development phase and/or immediate profit return is not required. Conversely, it was identified that if used extensively by a municipality, TIF can result in freezing the general tax base for up to 25 years, thus impacting on general revenue that supports other public programs and operations. Other arguments that support the TIF suggest that the instrument provides a positive market signal, thereby acting as a catalyst for private sector investment to create jobs and expand the city's tax base. Participants were also informed that given TIF's rely on a 'market test', cash-strapped municipalities are often driven by a public investment program that is based on the 'highest & best uses', to the exclusion of other public goods. Three basic financing vehicles using TIF, broadly identified in the literature (Pricewaterhouse Cooper, 2008), were also described. These three models were offered for session participants to consider given they are relatively straightforward in relation to representations about the degree of risk between the public and private sectors, as follows: (1) bond-funded: The municipality issues bonds secured against the projected tax increment, using revenue or general obligation bonds; (2) municipality-funded: the municipality borrows to provide the initial capital; and (3) developer-funded: the developer borrows to provide the initial capital—the municipality then reimburses the developer using the actual tax increment which the developer uses to repay its borrowing. During the gaming sessions, participants considered the advantages and disadvantages of the models, in addition to offering further variations to shift and/or share financial risk between the public sector and market-players.

3.4.3.3. Simulation Session. The simulation game was structured around three distinct phases. The intent was to produce sufficient flow that mimic the policy process to create psychological fidelity[2] (Lukosch & Bekebrede, 2014), which includes unexpected events that are beyond the control of the participants (Duke, 1980). The phases were designed to provide participants with sufficient information on which to base their recommendation and to provoke discussion as participants sorted through a thinking process, including introducing a degree of tension. No formal facilitation or intervention by the researchers was included. As a group self-driven process, it allowed sufficient room for participants to work with the materials and to structure the debate without influences arising from the researchers. Yet, the events introduced new information, thereby focusing players' attention on particular issues, and the distinct phases structured the process around the task of devising a recommendation.

Phase One: Began with a presentation by the Mayor to the group. The purpose of the presentation was to describe the scenario to participants, thereby setting up the problems and tensions. The problems and tensions are nested in the scenario, in what Duke refers to as 'the pulse' (1980). According to Duke, the pulse compels players to focus on shared phenomena. The Mayor kept in the role throughout the duration of the simulation in order to maintain what Klabbers (2009) refers to as 'the magic circle'. This phase of the simulation was styled on a meeting of professionals wherein the Mayor briefs participants about the project and the new financial instrument that they have been invited to analyze and make a recommendation to the Watervliet City Council.

Phase Two: Participants engaged in a 'brainstorm' session wherein they discussed whether property tax, as the income source of TIF, was the right income stream to support localize investments in climate adaptation, whether it was a potential instrument for the Watervliet Safe Haven Project, and whether there was a way to tailor the instrument that is specific to the Dutch sociopolitical context. During this phase, the Mayor provided three pieces of information: (1) a press release from the City's public relations department announcing the relocation of a large investor into the redevelopment project area; (2) a newspaper article announcing further budget cuts from the national government for city services; and (3) a petition from citizens from the abutting neighborhood protesting that they also experience flooding and it is unfair that only a community with market potential will receive long-term investment to address flooding issues.

Phase Three: The group was asked to make their final recommendation using a report template. A laptop was provided, and the report template was projected onto a screen to facilitate group interaction and discussion over the reasons and final recommendation.

4. Summary of Findings

4.1. Using a Market-based Mechanism: Institutional Dilemmas

In the remaining sections, we turn to answering the research question: Is a local-level market-based mechanism applicable for facilitating investment in adaptation? The response to the question is done by mapping the institutional dilemmas from the conceptual framework onto the core findings. The aim is to provide an account about why participants largely agreed that TIF was inappropriate for climate adaptation and to contextualize those perspectives.

4.1.1. Value Uncertainty Dilemma

The simulation scenario confronted all participants with a redevelopment project that required investments in new climate resilient public infrastructure. The scenario was presented as an opportunity to make strategic localized investments, based on a modest budgetary commitment, aimed at reducing future negative impacts of climate change and adding urban design features that improved the built environment. The pre-game questionnaire indicated that 81.5% strongly agreed to agree that there was enough scientific information to affirm that the climate is changing. The large majority of 83% strongly agreed or agreed that local government should plan now for long-term climate change. Despite the agreement about climate change, participants were not in agreement about when to invest in climate adaptation. The questionnaire found an average split of 29% between those that agreed that it was unclear when to invest, those that were uncertain, and those that thought it was clear when municipalities should invest. The majority, at 67%, agreed that more information is necessary in order for local government to take action. The questionnaire results were consistent with the dialog during the simulations insofar as participants agreed that climate change is a spatial planning policy concern, but perspectives varied from fully accepting that investment in adaptation must be part of contemporary planning practice to those that argued adaptation to climate change was not a critical issue requiring urgent attention.

Participants generally characterized investment in climate adaptation as a type of unclaimed public good that requires the government, as opposed to market-players, to play the primary role. This perspective rested on three questions that informed participants' discussions, which are also ubiquitous quandaries in climate adaptation policy-making: (1) What are the roles of the public and private sectors?; (2) What are the risks of investing and the risks of not investing?; and (3) Who benefits from investments and are such benefits fairly distributed? Participants generally argued given the answer to these questions remain unresolved, the government ought to play the lead role in facilitating investment in climate adaptation at the local level (i.e., from local, province, national, and waterboards[3]). The second core issue related to the degree to which property taxes should be used for 'hard' investments in a specific area. In the Netherlands, property taxes play a minor role in financing local investments and services due in part that the municipal financing system is largely based on two processes: (1) transfer payments from the national government (Allers, 2012) and (2) public land development practices have been fundamental to facilitating investment in community-based public (van der Krabben & Jacobs, 2013). The Dutch financing system is designed to keep the property tax rate low across the nation (Vermeulen & Allers, 2013) and to act as a modest buffer in municipal budgets. Simulation participants also voiced concern about whether channeling incremental property tax income into a specific area was 'fair'. This perspective was voiced more strongly by municipal participants based on an overarching concern that the application of TIF would create unequal adaptation results: meaning those in economically disadvantaged neighborhoods would not likely enjoy attention from the market. As stated[4] in the Amsterdam session: 'In my perception we [in the Netherlands] have a nicer inclination, the kind of value investment financing using TIF, as in America, … there is something fundamentally cold-hearted about using a tax measure'

The findings from the simulations are consistent with ideas that are part of an emerging narrative in the Dutch spatial planning sector. Over the last several years, practitioners, advisors, and researchers have argued that Dutch spatial planning ought to change from a 'supply' model to a market 'demand' model (Buitelaar, 2010). Such a model, it is argued,

should be based on municipalities facilitating public good investments (rather than financing) and working with stakeholders on 'bottom-up' driven planning process (rather than comprehensive master planning). Participants were largely able to align their perspectives (values certainty) by building on a nascent narrative about the transition of Dutch planning toward demand-led practices. This was possible because TIF can be characterized as a demand-led instrument that is fundamentally premised on positive market response to public good types of investments. Such an affirmative narrative was weakly articulated in relation to climate adaptation because the provision of such investments appeared to represent an 'old-fashioned' supply-led model. Which is to say, the narrative connected to climate adaptation confirmed and reinforced the values uncertainty dilemma.

4.1.2. Planning Horizon Dilemma: Mismatch with the Market

A consistent concern between participants and the groups, as a whole, was the market-based speculative nature of TIF. Imagining applying a financial instrument that is premised on future earnings from the real estate market was perceived as out-of-step with current political perspectives in the Netherlands. For market-players operating in the post-economic crisis conditions in the Netherlands, participants argued developers are in a good position to resist absorbing additional project costs or risks. The reasoning behind the government remaining as a key actor was twofold: Firstly, participants consistently argued that adaptation likely carries additional costs and any such investments will not be sufficiently valued in the market place. This finding is consistent with Tennekes *et al*. (2013) who suggest there is no guarantee that adaptation investments will generate higher market value, within the time frame conventionally required by investors. Secondly, the findings also indicate that if the investments are not valued in the market place, then the investments become a non-recoverable project cost using conventional processes in the Dutch planning regulatory framework. This perspective was stronger with municipal participants than nongovernmental participants. The former cited the unlikelihood of political support for such a market-based instrument, given market-driven strategies have resulted in substantial financial challenges for municipalities across the Netherlands (Janssen-Jansen & Lloyd, 2012). As stated by a Nijmegen participant, '… it is, of course, the classic mistake that municipalities have ever made. The purchase of land and hope that it will be worth something. The risk lies with the municipalities'. Private sector participants were less pessimistic suggesting that the advantage of TIF was that it might fit well with conventional Dutch planning and development practices because it is consistent with conventional practice of using residual value from the land development process to cross-subsidize a range of public goods (van der Krabben & Jacobs, 2013). The difference between those perspectives is that the latter participants tended to focus on the possible flexible ways in which TIF could be applied to facilitate investment and spread risk between more a diverse range of players—but not for climate adaptation investment, just in general.

The evidence indicates that session participants situated the planning horizon dilemma as a mismatch between two issues: Firstly, there was uncertainty about the investment phase and the degree to which the market would respond sufficiently to render projected value. Secondly, the strong prerogative was to cite the lack of political support to make explicit adaptation investments: In the context of shrinking municipal budgets and competing investment priorities, climate adaptation has insufficient urgency to justify immediate action. As stated by a Den Haag participant:

> We have been working on climate adaptation for a few years and we are convinced that climate change adaptation is a topic that generates no extra money. Politicians are not prepared to give extra money because the urgency is still too limited. We do not think of additional budgets. We think of linking them with clever restructuring of existing urban areas. We still have decades of time.

As crystallized by the above quote, lacking political support and resources, there is little incentive for undertaking immediate substantive actions. Rather, the strategy to overcome such barriers is by incrementally integrating adaptation measures. An incrementalist strategy assumes it can withstand political cycles and gradually integrate climate adaptation into planning and operational routines overtime.

4.1.3. Indirect Benefits Dilemma

We begin this section with two unambiguous quotes made by simulation game participants in different sessions:

- … if you want housing corporations to invest in climate proofing, that requires a lot of upfront investment. The benefits will not flow back to the corporation, so it is an uneconomic road (Amsterdam session).
- I can tell you from experience that most of my buyers and renters do not care much for the word heat-stress or flooding. Everyone thinks we're safe here. So, I do think there is a big difference between customer perception and actual risks you run. If it does not happen often the client thinks that they are not going to pay for it (Rotterdam session).

Section 2.1.3 identified a core principle of the benefits model of public financing as needing to successfully make a clear connection between local expenditures and local benefits. This principle is evident in sentiments expressed in the above quotes, which clearly illustrate the dilemma and burden of proof that is required by policymakers to demonstrate the direct benefit of adaptation investments. When considering using finite local resources participants argued that if investments are made in climate adaptation funding will not be available for other investments. Participants, thus, conceived of the problem as having to make decisions between investments that will result in direct benefits and adaptation investments, it was argued, that will result in benefits sometime in the future to unknown beneficiaries.

A strategy to address the indirect benefits dilemma focused on how risks, costs, and benefits could be spread between direct beneficiaries and the public and private sector. For example, as stated by participants:

- The question is, for private property owners, can you use similar incentives for them to invest in measures to retain more water, perhaps also recovering investments with tax value … you make a combination … because I think it is important that we all shoulder the burden and that we do not say—'corporations, you do it' (Amsterdam session).
- The question is, who will stick their neck out? You do not expect the market to do that, because it does not invest in loss. Do not expect that the government is going to do, because it is in the red and is also limited. How are we going to divide or limit the risk? (Nijmegen session)

The groups developed variances of how TIF could be applied to balance financial risk between current stakeholders and future beneficiaries. Unsurprisingly, a concise answer as to how different stakeholders could participate in risks and benefits remained unanswered.

Drawing from Tenneke *et al.*, discussions about the types of mechanism that could reconcile the indirect benefits dilemma are, in fact, highly charged political discussions. By debating the technical merits of TIF as a potential instrument to facilitate investment in local adaptation participants teased out and engage with contentious issues about '… institutionalized distributions of burdens and benefits' (Tennekes *et al.*, 2013).

5. Conclusions and Final Remarks

Lack of funding is often cited as a substantial barrier to making investments in local climate adaptation. Yet, as asserted by Measham *et al.* (2011), lack of funding is a 'surface constraint' (906) and too simplistic of an explanation as to why investments in climate adaptation lose out to other priorities. Similarly, in asking whether a local-level market-based mechanism is applicable for facilitating investment in climate adaptation, we find evidence that, on one level, TIF has more limitations than application opportunities to finance climate adaptation at the local level in the Netherlands. This is due primarily to current economic and political dynamics percolating in Dutch planning based on the reluctance to rely on speculative earnings from real estate. Yet, these reasons may also represent 'surface constraints' because the disinclination to use TIF was not specific to TIF as an instrument per se. The three key dilemmas (values uncertainty, planning horizon, and indirect benefits) are evident in the narrative of the participants, which shaped how participants responded to both (1) investing in adaptation and (2) in the use of local income, which is to say, property taxes. While participants found a degree of value certainty about climate change, they struggled to reconcile the degree to which municipalities ought to underwrite long-term investments or whether the market will recognized the added-value in the foreseeable future.

We began the article by asserting that investment in urban public infrastructure will be required in the coming years to mitigate the impacts of climate change at the local level. The findings have produced insights about the relationship of the dilemmas in shaping practitioners perspectives about a possible financing instrument. In doing so, the analysis points to the limited acceptance that a market-based financing instrument is, currently, likely to have in the Netherlands. In contrast, participants appeared to be generally interested in TIF for conventional area investments, with some reservations, insofar institutional space was made available to imprint an incrementalism and customize TIF into a 'made in the Netherlands' instrument. As a participant commented,

> …. 'made in the Netherlands', the Dutch way, can we imagine that kind of TIF? [Yes], for example, stringing together a number of business cases, which are smaller, short-term, and therefore are more manageable in terms of risk and return. (Amsterdam session)

These contrasting perspectives suggest that by mapping the dilemmas onto whether they would unreservedly recommend TIF, participants imposed a financial barrier on adaptation investments. Thus, we learn that the potential financial gap was not necessarily actual, but rather an outcome based on the dynamics of the institutional context and the perceived constraints that were informed by the climate adaptation dilemmas. A key imperative in the design of financing instruments would be to pay attention to the congruency of informal institutions at the 'street level' (Buitelaar *et al.*, 2011). In order to be in-step with the current Dutch sociopolitical conditions, we extrapolate that market-based financing instruments need to be aligned with several attributes. These attributes represent a composite of the final recommendations made by the seven simulation groups. To overcome the project's financial

gap, we learned that the design of a market-based instrument would need to align with the following principles: incrementalism, long-term financial risk management, risk sharing between stakeholders, and be bundled with a diverse package of instruments.

5.1. Final Remarks and Further Research

The state of local climate adaptation policy and planning practice is in its formative years, hence local policy instruments are often crudely formulated (i.e. governmental actions using regulation and/or subsidy) in comparison with the range of options that have been applied to address complex social and physical planning problems—i.e., sophisticated governance strategies from regulatory to financing and management models between government and nongovernmental entities, and communication strategies aimed at behavioral changes, which have been refined through repetition and learning. While the history of urban planning provides evidence of policies and processes that resulted in unanticipated and undesirable outcomes (Jacobs, 1993), these are the instruments of modern planning. Indeed, the research findings reflect Savini's (2013) observation that the paradox of urban planning is while, on the one hand, it is viewed as a technocratic undertaking, in practice, however, the dilemma is that despite the intention to rationally 'steer' change, in reality planning '… entails a series of compromises over different trade-offs, based on politically and arbitrary constructed visions of the specific problem at stake' (336). Secondly, the findings do not provide an answer to those practitioners with a thirst for instruments that will simplify the climate adaptation process. Rather, the analysis identifies an urban planning puzzle wherein a technical fix is only part of the answer to facilitating investment in climate adaptation. Simulation gaming is a method that provides a strategy to sort out the governance puzzle. By examining the interactions between participants and how they made the interconnections between, to some degree, disparate issues (i.e., application for property taxes, investment in local climate adaptation, and TIF), it proved an effective method to uncover the possibilities of achieving an institutional fit.

Methods that enable exploration and organizational learning are a growing area of interest in the field of governance-oriented climate adaptation research (Baird *et al.*, 2014; Jordan & Huitema, 2014). Given the potential cost of failures in the messy world of policy-making, simulation gaming is a platform that enables participants to 'join-up' the components of a scenario in a confined and 'safe' place in comparison with real-world practice. Further research could aim to explore how planning practitioners interact with different policy instrument arrangements and the degree to which the characteristics of the institutional dilemmas could be overcome, including reducing organizational uncertainty and enforcing affirmative narratives about integrating climate adaptation measures into routines. Indeed, a principle of heuristics is the fluidity in how strategies to reduce complexity in decision-making are selected and learned on an ongoing basis through social processes (Gigerenzer & Gaissmaier, 2011).

Notes

1. See research a website hosted by the National Office for Entrepreneurial Netherlands called the Financial Structure Toolbox. and reports by consultancies and research institutes VROM,

C. (2010), ECORYS (2010), Ministry, o. I. A., VNG & NEPROM (2009), Planbureau (2014), Planbureau and Urhahn (2012), and Heijkers *et al.* (2012).

2. According to Lukosch and Bekebrede, psychological fidelity relates to the degree to which a game matches the emotional and cognitive perceptions of the players, which includes, the play process and flow of the game (2014).
3. 'Dutch water boards (Dutch: *waterschappen*) are regional government bodies charged with managing water barriers, waterways, water levels, water quality and sewage treatment in their respective regions.' Source: http://en.wikipedia.org/wiki/Water_board_%28Netherlands%29
4. All quotes have been translated from Dutch to English.

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